SOLUTION APPROACH

Each unicycle is independent and multi-agent interaction will not be considered. The steps required to solve the problem are the following:

Step 0

Average consensus computation starting from initial conditions of the agents.

Then for each unicycle

Step 1

We apply posture regulation scheme in order for the unicycle to get closer to the consensus

Step 2

When the unicycle is close enough to the consensus we switch controller and we apply the trajectory tracking controller.

Note: every time a unicycle get close enough to the consensus is not waiting the others to switch to the trajectory tracking controller.

POSTURE REGULATION

1. GAIN CHOICE: k1, k2, k3 had no choice constraints (just being positive). So we adopted trial and error method to choose the value
2. REFERENCE CHOICE: the literature provides us the control scheme given the null reference [0,0,0], but in our problem we want to converge to a non null vector ( average consensus ). Obviously giving as input a non null vector was not a working option so we implemented an OFFSET BLOCK that changes the reference frame. The desired reference frame is the one with the has the consensus as the origin.

TRAJECTORY TRACKING GENERAL

1. We previously discussed that trajectory tracking controller takes over the regulation one. This means that initial conditions of the system must be inherited from the last available state given by the posture regulation scheme. (See Simulink scheme TRAKING\_IC)
2. GAIN CHOICE: for linear and non-linear control we followed theory. For the other two trial and error

NON LINEAR CONTROLLER

PARAMETERS:

* Inner circle trajectory radius = 1
* Outer circle trajectory radius = 4

ASSUMPTION:

For now we assume to start outside outer circle

GOODNESS TEST:

We developed the ERROR TEST block that allows us to check if each and every unicycle is converging to the desired trajectory. This gives us an immediate result to check convergence.